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Science Summit Best Practices

SESSION: RESEARCH

Region 1

Title: Asthmagen Sampling in Boston Public Housing

Best Practice: Community Based Participatory Research: Bringing together community stakeholders and clients as part of the research team to address real life environmental threats and hazards. Aligning ORD researchers with community, State, and Academic partners on a common goal early on in the research plan ensures successful measurable outcomes.

Background: The incidence of asthma in children nationally is very high and continues to be a serious environmental threat to human health and well being. Studies needed to be conducted in actual homes and in public housing that would allow EPA to identify the most significant asthmagens to help identify the best preventative measures and best practices from exposure.

Science: Region 1 and ORD initiated this study by forming a research group composed of representatives from the Boston Public Housing authority, Harvard University, Boston University, Mass DEP, city government, selected housing tenant groups, and several philanthropic organizations. Together, the group determined the best course of action for designing and coordinating a sampling and analysis protocol that would provide the necessary data needed to implement corrective remedial measures and preventative practices. An extensive characterization of both chemical and biological asthmagens was completed and the results underscored the importance of nitrogen oxides as well as chemicals from cleaning agents. The results provided the research group with the data for determining how to implement cost effective interventions that were easily implemented; encouraged residential response; and resulted in safe and healthy housing for Boston residents.

Outcomes:

- A national asthmagen sampling protocol with communities in mind.
- Guidance on the effectiveness of specific interventions based upon measurable health improvements in the resident populations in Boston. Ex. Pest controls.
- Several Peer Reviewed publications with research partners & policy guidance.
- The project resulted in the establishment of the Asthma Regional Coordinating Council (ARC) which is now a consortia of members from EPA, HUD, HHS, Academia, non-for-profits, numerous state programs, and community health organizations.
- The results also were used to promote asthmagen mitigation through preventative measures at public schools throughout New England.
- Reduced frequency of asthma in the population study during follow-up analysis.

Region 2

Title: Resuspension of Fibers from Indoor Surfaces due to Human Activity

Best Practice: ORD's own expansion of a RARE-funded research project.

Background

The events of 9/11 and the subsequent related activities released an enormous particulate load into the environment proximal to the WTC complex. This aerosol burden included building material fragments that contained asbestos and other mineral fibers known or suspected to be health hazards. Although much of the aerosol subsequently deposited outdoors, a significant portion penetrated into nearby residences and businesses. A large fraction of the aerosols that penetrated these buildings deposited onto horizontal and vertical surfaces. Normal occupant activities can resuspend portions of the deposited aerosol on horizontal surfaces. Walking on medium pile carpeting is known to resuspend particles in the 2 to 10 μm range (Rodes and Wiener, 2001). This aerosol can result in unhealthful asbestos and other mineral fiber aerosol concentrations within the general vicinity of the activity and translocate the aerosol to other locations and surfaces within the building.

The RARE supported research for this project was conducted in collaboration with the National Risk Management Research Laboratory's (NRMRL) Air Pollution Prevention and Control Division in RTP, NC. The results obtained through this project are being utilized by Region 2 to inform assessment of the risk posed by asbestos-contaminated carpets. Although air sampling is the optimal medium for assessing risk from re-entrained asbestos, air sampling is costly, time consuming and the results subject to significant variability secondary to activity patterns during the sampling period. Surface sampling for asbestos is readily accomplished; however, the asbestos load (fibers per unit area) must be related to indoor air concentration in order to assess the potential risk posed by asbestos in settled dust. Limited research has been performed relating asbestos loads on hard surfaces to indoor air concentration; studies on carpeted surfaces are practically non-existent. This research has provided valuable data on the basic relationship between asbestos loads in carpets and indoor air as well as useful information on the factors that influence that relationship such as carpet sampling methods, air sampling location, asbestos loading, carpet age, activity patterns (e.g., walking, vacuuming) and relative humidity. Ultimately the results of this research will help inform clean-up decisions for asbestos on carpeted surfaces secondary to the WTC collapse. Further investigation of these mechanisms and their influence on emission factors will provide the requisite data needed for robust modeling of exposure to resuspended particles for more generalized application. Towards this end, ORD-CIN has expanded on the Region 2 RARE fiber re-entrainment study and is currently investigating the relationship between asbestos in soil and ambient air and asbestos on both hard and porous indoor surfaces and indoor air. Regarding the indoor work, ORD-CIN is working with Region 2 staff to obtain asbestos-contaminated carpet samples from a WTC-impacted building (Fiterman Hall) that is

scheduled for deconstruction. Employing carpets with actual asbestos contamination eliminates the uncertainty associated with using an asbestos surrogate (e.g., Wollastonite) when performing fiber re-entrainment studies.

Science:

This research was directed toward 1) determining the quantity of asbestos simulant fibers resuspended (emitted) as normalized by the amount deposited, and 2) calculating asbestos simulant fiber emission factors at two heights while walking on and vacuuming seeded carpet. The asbestos fiber simulant selected for this research was calcium silicate, commonly known as Wollastonite. Three methods for measuring the quantity available for resuspension were studied:

- a. MicroVac method following a modified version of ASTM D5755-95,
- b. Ultrasonication method developed by Millete *et al.* (1993),
- c. Individual carpet fiber analysis via scanning electron microscopy.

Wollastonite resuspension during walking and vacuuming was studied. Total quantity and size dependent fractions of resuspended Wollastonite were measured gravimetrically and with real-time aerodynamic particle instrumentation, respectively. Established experimental procedures were followed to seed new and old carpet with Wollastonite, characterize the quantity and size distribution of simulant fibers deposited on the carpet, resuspend the simulant fibers within an exposure chamber, and collect representative samples of resuspended fibers. The research defined a fractional carpet resuspension emission factor as ratio of Wollastonite resuspended and Wollastonite available for resuspension on the surface. The best method for estimating the amount available for resuspension was the modified MicroVac technique. This simple method only collected Wollastonite from the upper carpet fiber surfaces that were potentially available for resuspension; Wollastonite fibers embedded deep in the carpet with low probability of being resuspended were not collected. SEM analysis of individual carpet fibers worked only for new carpet fibers. Old carpet samples typically had too many “background” particles that confounded the analysis. The Millete *et al.* ultrasonication method poorly estimated the quantity available. The removal of a carpet plug and sonic bath released a very high number of carpet material particles that completely overwhelmed the ability to detect Wollastonite.

Outcome:

Simulant fiber emission factors ranged from < 0.01 to 0.45, with the majority falling between 0.01 and 0.10. Emission factors and K-factors for Wollastonite will be upper-limits when applied to real asbestos fibers due to the difference in their aspect ratios. As expected, experimental conditions (primarily resuspension method, carpet age, and relative humidity) affected the emission factors. The majority of Wollastonite fibers resuspended from carpets were between 2 and 10 μm , with particles between 2 and 6 μm yielding the highest mass emission factors. The vacuum beater bar did resuspend a significant number of sub-micrometer particles that did not contribute much to the mass resuspended. Emission factor testing did not elucidate the influences of electrostatic and surface tension adhesion forces between the Wollastonite and carpet fibers in determining the amount available for resuspension. As noted above, further investigation of these

mechanisms and their influence on emission factors will provide the requisite data needed for robust modeling exposure to resuspended particles.

**Title: Water Quality and Biological Impacts of Disrupted Great Lakes'
Food Webs and MED Involvement in LO Intensive Monitoring**

Best Practice: ORD's collaboration with Regional, Program Office, and Binational partners and participation in large-scale monitoring efforts.

Background

Region 2 and ORD Duluth Mid-Continent Ecology Division (MED) have collaborated on the development and execution of a number of monitoring efforts since the mid 1990s to understand the impact that invasive dreissenid mussels have had on Lake Ontario's foodweb. This relationship was strengthened when ORD MED joined the US-Canadian Lake Ontario Lakewide Management Plan's (LaMP's) 2003 Intensive Monitoring Year through the RARE grant process where ORD facilitated the interpretation of lower aquatic foodweb and water quality data collected the LaMP's multi-party binational effort which also included MED field testing new remote sensing techniques. MED staff are now considered key players in the development of R2 Lake Ontario monitoring approaches. In the upcoming 2008 Lake Ontario Intensive Monitoring Year, R2 is working to coordinate planned MED nearshore monitoring activities with other nearshore US and Canadian LaMP monitoring efforts that will allow the development of a more comprehensive understanding of how different types of shoreline/watershed characteristics can impact nearshore water quality and biological issues.

Science

Despite significant water quality improvement in the open waters of Lake Ontario over the last three decades, the arrival of the exotic zebra and quagga dreissenid mussels in the 1990s marked the beginning of a series of dramatic changes in the lake's ecosystem beginning with the extirpation of Lake Ontario's keystone benthic organism, *Diporeia*. A decade later we find the offshore waters of Lake Ontario to be almost severely oligotrophic while nearshore waters are experiencing increasingly severe eutrophication problems. These changes have potentially altered the carrying capacity of the lake and threaten efforts to restore naturally reproducing populations of native fish such as lake trout.

One possible explanation for these changes is that the transport of nutrients from the nearshore to the offshore has been disrupted by coastal dreissenid mussel beds and associated algae. A key question is to what extent has the retention (and accumulation) of nutrients and pollutants increased in the nearshore and, conversely, the supply to the offshore declined? This question is particularly relevant to phosphorus since much of the total phosphorus input to the lake are in particulate form, originate from the nearshore, and are now susceptible to being retained in the nearshore than prior to the establishment of the dreissenid mussels. There is substantial potential for dreissenid mussels to enhance benthic algal growth by increasing habitat availability through greater water clarity and by enhancing nutrient supply through excretion or indirectly through the accumulation of

particulate material in mussel beds. More simply, the Dreissena and Cladophora beds could be acting as biological filters removing and retaining phosphorus in the coastal zone and thereby reducing the amount transported to the offshore.

Outcome

Given the vast scale of the Great Lakes, and recognizing that both US and Canadian programs have limited budgets, our future success in understanding changes in the Great Lakes system will depend in large part on our ability to assemble collaborative multi-party efforts that can leverage resources. The lack of basic understanding of the causes of significant changes in Great Lakes biota and water quality will severely hamper EPA's ability to develop effective monitoring programs and management actions needed to address Great Lakes water quality and natural resource problems.

The development of new field methods and in situ instrumentation, such as towed remote sensing instrumentation with the capability for rapid, near real-time, quantification of zooplankton biomass, chlorophyll and phytoplankton divisions promise to provide cost effective monitoring approaches. Ideally interpretation of these types of field observations should be meshed with satellite observations that can inform us on large scale hydrologic and biologic events that may otherwise go unrecognized. The coordination and synthesis of these multi-levels of data remains a significant organizational challenge. REMAP and RARE grant programs will continue to provide an important mechanism to allow Regional Offices to interact and take advantage of the technical and scientific expertise that ORD has to offer.

Region 4

Title: Heavy-Duty Diesel Vehicle Activity Factors Analysis

Background: As emissions from light-duty vehicles have decreased (due to regulatory requirements), the relative importance of emissions from heavy-duty diesel vehicles (HDDV) have increased significantly. HDDV engines have not been as rigorously controlled as light-duty gasoline engines. HDDVs produce relatively large amounts of NOx and PM and are kept in service for much longer periods of time than light-duty vehicles.

Because HDDV emissions have become a larger part of total vehicle emissions, it is important to increase our understanding regarding the sources, types, and patterns of movement of these emissions. This increased understanding is enhanced by the development and use of computer models. Region 4, ORD's National Risk Management Research Laboratory, and the Georgia Institute of Technology collaborated on a project to develop an HDDV module that could be incorporated into a generally-accepted model used to estimate mobile source emissions. This module better represents HDDVs as a component of the universe of mobile source emissions.

Science: The various tasks conducted as part of this project were all directed toward the goal of developing an HDDV emissions module that would be integrated into the Mobile

Emissions Assessment System for Urban and Regional Evaluation (MEASURE) model. MEASURE is used for research purposes to evaluate improved methods for estimating mobile source emissions

Producing a module for insertion into a model is essentially developing a smaller model that fits into a larger one. The tasks consisted of a variety of activities both in the laboratory and in the field. Laboratory activities were strongly oriented toward mathematics and computer applications. Developing algorithms and equations to represent HDDV activity on the roadways was a highly technical task that was necessary to assure that the attributes of diesel vehicles such as HDDV emissions rates as a function of engine horsepower class, and basic engine power equations were accurately represented in the module.

The field component of this research was needed to expand the universe of HDDVs that received consideration in the module to include buses. Georgia Institute of Technology scientists equipped two Metropolitan Atlanta Rapid Transit Authority (MARTA) buses with an instrument known as a Trip Data Collector (TDC). The purpose of the TDC was to collect and process on-road bus operating data to develop data inputs to the module. The TDC consists of a 386 Linux CPU that is capable of sensing vehicle ignition, speed, and global position. Using the TDC, the researchers were able to construct transit bus emissions rates that were functions of the vehicle's speed-acceleration profile. Emission rates were calculated for both local bus routes that required frequent starting and stopping and express bus routes that required infrequent stopping.

Outcomes: Region 4 has used the results from this project for several purposes, including providing input for national-scale models, providing state-of-the-art information to interested organizations, and evaluating possible control strategies. Because the emissions module that was developed as part of this project provides a high level of detail regarding HDDVs, it has been offered to EPA's Office of Transportation and Air Quality (OTAQ) for evaluation for inclusion into OTAQ's MOBILE model

Region 5

Title: Predicting MTBE Diving Plume Behavior at Contaminated Ground Water Sites

Problem Statement: Develop models for predicting the movement of MTBE from leaking gasoline tanks into ground water to assist Region 5 and the States respond to a number of multi-media environmental issues surrounding the use of methyl tertiary butyl ether (MTBE) and other fuel oxygenates.

Background: The Agency has been forced to respond to a number of multi media environmental issues surrounding the use of methyl tertiary butyl ether (MTBE) and other fuel oxygenates. In Region 5, MTBE from various sources - but mainly from leaking underground storage tanks (LUST) - has contaminated groundwater. In some cases, drinking water has been impacted resulting in communities being forced to adopt

expensive alternatives (Island Lake, Illinois; East Alton, Illinois; Mishawaka, Indiana and others). One of the physical properties of MTBE, especially when compared with other petroleum hydrocarbon chemicals of concern (COCs), is that it is very soluble in water, allowing the MTBE to “dive” below monitoring well networks that are designed to detect petroleum COCs near the surface - thereby leading some sites to be falsely perceived as not being a threat.

To facilitate an understanding of the problem, Region 5 cooperated with ORD to fund a RARE project to assess MTBE plumes at three sites including: 1) Spring Green, Wisconsin; 2) Milford, Michigan and 3) East Alton, Illinois. The goal for this project was to provide specific tools or models to help state and federal environmental regulators overseeing LUST corrective action projects.

Positive Outcomes: Site work provided data to generate models for predicting MTBE contamination based upon ground water flow, well pumping and other parameters

The developed models for predicting the movement of MTBE from leaking gasoline tanks into the ground water were demonstrated to state and region staff dealing with Leaking Underground Storage Tanks (LUST), and resulted in modified site characterization investigation guidance documents.

Regional and ORD Staff Involved: Region 5: Gilberto Alvarez
ORD: John T. Wilson, Randall R. Ross and Steven Acree with the Ground Water and Ecosystem Restoration Division

What Made the Project Successful: Good cooperation between Regional staff, states and ORD scientists, expert staff at ORD familiar with problem, and confidence in the developed models because of the actual ground water measurements.

Title: Reducing Disposal Risk from Chronic Wasting Disease Impacted Animals

Problem Statement: Evaluate the transport of CWD within landfill material to determine best methods for disposing of impacted animals in landfills.

Background: CWD is a fatal neurologic disease of deer and elk caused by an infectious abnormal protein called a prion. Infected free-ranging or captive deer and elk have been found in several states including Wisconsin, Illinois and Minnesota in Region 5. The management of CWD may call for the harvesting of many deer or elk in an infected area. For example, Wisconsin’s management plan calls for the harvesting of 25,000 deer from a 360 square mile area. These plans create a significant need for safe and effective disposal options for the infected carcasses and other materials.

Primary disposal options include landfiling, incineration, and rendering. Municipal solid waste landfills are available in the States with CWD-infected animals and most have sufficient disposal capacity. However, landfill owners and operators are reluctant to

accept these wastes because the risks associated with landfilling these wastes are not well known. Of particular concern is the potential for prion-contaminated leachate from a landfill to contaminate biosolids at a wastewater treatment plant that accepts the leachate. Since biosolids are often applied to farm fields there is concern that this process may spread the disease.

A cooperative research project with ORD through the RARE program conducted tests to assess the viability, fate and transport of CWD prions in a municipal solid waste landfill environment. Laboratory studies will be conducted under controlled conditions emulating field conditions.

Positive Outcomes: Laboratory work with CWD prions and landfill materials showed that clay packed above and below carcasses reduced the transport of prions, and that alkaline substances (such as fly ash) increase transport and should be avoided.

The work provided a recommendation for modified guidance for disposal of infected carcasses in landfills.

Regional and ORD Staff Involved: Region 5: Susan Mooney, Waste, Pesticides and Toxics Division ORD: Fran Kremer, ORD-NRML, Cincinnati, Ohio

What Made the Project Successful: The opportunity to leverage the project through a large DOD grant to the contracted institution (University of Wisconsin). good cooperation between Regional staff, states and ORD scientists and expert staff at ORD familiar with problem.

Region 6

Title: Providing for Review of Sampling Plans during Aftermath of Hurricane Katrina

Best Practice: Help in Crisis Situations. Providing quick support and partnership when a crisis strikes..

Background: Hurricane Katrina devastated the City of New Orleans in late August, 2005. Region 6 was faced with a crisis on many fronts. Part of the problem was the need for sampling of flood waters and sediment as the water receded. The data taken from these media needed to be taken quickly, be accurate, and be available quickly for the joint incident command and also for the media. In other words, it had to be right, and it had to be quick.

Science: The Deputy AA for Science personally took responsibility for getting the EPA Science Advisory Board involved in reviewing the sampling protocols proposed by Region 6. This involved getting the SAB together within one day, and turning around various protocol reviews within one day each (even over a weekend). The Region had few prior interactions with the SAB, and ORD's experience and help here was invaluable.

Outcomes: The sampling protocols were approved quickly, allowing EPA to sample and make public the data in short order. The data was widely recognized as valid and answered many questions about the state of the New Orleans environment soon after the disaster.

Region 7

Title: Water Quality Vulnerability in the Ozarks Using Landscape Ecology Metrics

Goal

- Development of water quality indicators using landscape metrics in the Upper White River Basin for the purpose of addressing the concerns about surface water quality in the Upper White River ecosystem

Outcomes

- New land cover and landscape metric maps (1970-2003)
- Sub watershed predictive models for key water quality parameters using a broad scale ecological approach

Environmental Benefit

- Provision of a specific criterion for water quality among watersheds using stakeholder input!
- Cost-effective method for “targeting watershed for other focused efforts
- High likelihood that the results are true
- A quantified level of error for ecological conditions described among watersheds
- Addressed the unique challenges of “targeting” non-point sources using real ecological assessments.

EPA Contacts

ORD Principle investigator – Ric Lopez

Regional Science Liaison – Brenda Groskinsky

Region 8

Title: Prion Fate in Wastewater Systems

Background:

Prions are thought to be the causative agent of transmissible spongiform encephalopathies (TSEs) in animals, including chronic wasting disease (CWD) in deer and elk, scrapie in sheep and goats, and mad cow disease in cattle (bovine spongiform encephalopathy, BSE). Infectivity appears to be transmitted by an abnormally folded form of a host-encoded protein. EPA Region 8 and the Office of Research and Development through the Regional Applied Research Effort (RARE) program supported research in an attempt to understand the fate of prions in the environment and in

engineered systems to develop options for managing waste streams generated from infected animals and associated waste materials. In addition, EPA Region 5 has supported research to assess the fate and transport of prions in a landfill environment. Other Agencies such as the U.S. Department of Agriculture, the Food and Drug Administration, and National Institutes of Health are also supporting research in areas including food safety and infectivity.

Research Conducted:

Scientists in EPA's Office of Research and Development (ORD) National Risk Management in Cincinnati, Ohio and researchers at the University of Wisconsin-Madison (UW) are working in collaboration with EPA Region 8 to: (1) enhance the understanding of the fate and persistence of prions in wastewater treatment systems; (2) aid in the development of best management practices for handling and disposing of prion-contaminated waste; and (3) assist in development of EPA regulations concerning the discharge of prion-contaminated wastewater into publicly owned treatment works (POTWs) and septic systems.

Preliminary results from initial studies at UW have focused on recovering prions experimentally added to wastewater solids and examining the partitioning of the protein between the solid and liquid fractions. These studies were performed using the solids from a municipal wastewater treatment plant (WWTP) and were conducted in laboratory microcosms. An extraction method has been developed that is able to extract prion protein experimentally spiked into various solids. It is anticipated that this research will ultimately enable the quantitative tracking of prion protein through simulated treatment processes.

Initial results indicate that if prions were to enter wastewater streams, most would partition to the solid phase. Preliminary findings also suggest that a small fraction of prions would remain in the liquid phase.

Regional Application and Environmental Outcomes:

Preliminary results were presented at the 2005 EPA Science Forum. Region 8 gained additional expertise and participated in the development of the research involving the detection and fate of prions in treatment and disposal options through involvement in the Regional Research Partnership Program. Several peer-review journal articles have been published as a result of this research and an Agency wide webinar is planned for fall of 2008 to share these research results. Region 8 incorporated these research results in the permit issued for a Colorado Division of Wildlife facility in Ft. Collins, CO and these results will continue to aid in the regulatory and development of best management practices for disposal options for potentially CWD infected animal material.

Title: Mercury Source Identification and Risk Management Recommendations on the Cheyenne River Sioux Tribal Lands

Background:

In a collaborative three year study with the Cheyenne River Sioux Tribe Department of Environmental Protection (CRST DEP) and EPA's Emergency Response Team and Region 8, elevated levels of mercury were detected in fish tissues from the Cheyenne River and Lake Oahe in northwestern South Dakota. From these findings, the CRST, in 2000, released a fish advisory recommending less consumption of fish, especially for pregnant and elderly individuals. As an alternative to fish consumption from Cheyenne River and Lake Oahe, the CRST recommended its members consume fish from livestock ponds located on tribal lands. However, elevated mercury levels were also detected in these fish. A regional applied research effort (RARE) was initiated to determine the source of mercury in fish tissues from livestock ponds on tribal lands and provide risk management recommendations to reduce mercury exposure to tribal members.

Research Conducted:

Scientists in EPA's Office of Research and Development (ORD) National Exposure Research Laboratory in Athens, Georgia along with Region 8 and the CRST DEP collected field data for input into a model to simulate mercury fate and the dynamics of bioaccumulation within these livestock ponds. Research objectives were to: (1) determine the source of mercury bioaccumulating in fish tissue and (2) provide risk management recommendations to tribal members so as to reduce their mercury exposure. The primary focus was to determine if the source of mercury was related to aerial deposition or naturally occurring sources related to geologic formation. Given the many factors which influence the fate and transport of mercury, these stocked ponds were studied to better understand mechanisms of mercury bioaccumulation when there are no apparent point sources.

Regional Application and Environmental Outcomes:

Livestock ponds present unique challenges to static mercury models due to:

- high pH, high conductivity, hyper-eutrophic, high surface area to volume ratio;
- high degree of water fluctuation on an annual basis;
- little to no flushing or outflow of surface water;
- shallow and well-mixed with no summer stratification;
- losses of elemental mercury via evaporation tend to be high and;
- particulate and dissolved organic matter are critical inputs into model.

Fish tissue results show that larger fish like the Northern Pike have higher amounts of methyl mercury (786 ppb) greater than the national average (360 ppb). Risk management recommendations to the CRST DEP include reviewing existing fish advisories, limiting intake of larger fish species like the Northern Pike and possibly considering the analysis of blood and hair to monitor past mercury exposures.

Additional benefits from these research results include:

- the use of these farm ponds as model ecosystems for use in EPA's mercury benefits analysis in the Clean Air Mercury Rule;
- the use of this information in risk management decisions for a nearby Superfund site remedial investigation and;

- technical transfer of these research results to EPA's Ecological Risk Assessment Forum.

Title: Development of a Toxicity Assessment for Libby Amphibole

Background:

In order to determine a comprehensive and protective site remedy for the Libby Superfund Site, EPA must complete a baseline risk assessment. Currently, scientific uncertainty exists with the toxicity and health risks associated with Libby Amphibole. At the beginning of 2008, a Steering Committee was established to identify data gaps necessary to support an assessment of human health risk stemming from exposure to Libby Amphibole and a list of studies that are needed and their relative priorities in terms of completing the Libby toxicity assessment. Members of this Steering Committee included representatives from ORD/NHEERL, ORD/NCEA, OSWER, and Region 8.

Research to be Conducted:

The proposed toxicity assessment support studies will include:

- a) Libby Amphibole RfC Development
- b) Libby Amphibole Cancer Assessment
- c) USGS Preparation of Libby Testing Material.
- d) Fiber Size Distribution in Libby
- e) NHEERL Dosimetry Model Development and Simulation Studies
- f) NHEERL In Vitro Dissolution Assays
- g) NHEERL In Vitro Toxicity
- h) NHEERL Comparative Toxicology in Mice and Rats
- i) NHEERL Inhalation Toxicology in Rats
- j) New Epidemiologic Information from Libby Montana Cohort
- k) New Epidemiologic Information from Other Cohorts
- l) OSWER Interim Risk Methodology for Quantification of Cancer Risk from Inhalation Exposure to Asbestos.

And proposed analytical methods studies will include:

- m) Filter Verification
- n) Low-Level Soil Method Development.
- o) Comparison of Direct & Indirect Preparations.
- p) Ambient Air Collection Method Verification

Expected Regional Application and Environmental Outcome:

The proposed toxicity assessment and analytical methods studies along with the exposure assessment will comprise the baseline risk assessment that is needed to support a Record of Decision (ROD) for the Libby site. The goal of the Baseline Risk Assessment (BRA) is to evaluate: 1) risks as they existed before EPA began cleanup actions, 2) the level of risk remaining after EPA cleanup actions are complete, and 3) risks to individuals in the future.

Region 9

Title: Research Planning to Respond to Climate Change – Involving States

Background:

As a result of a visit to Region 9 by Joel Scheraga, NPD for global climate change, Region 9 has organized a workshop to examine the potential impacts of climate change on air quality in our Region. The workshop will bring together key STAR grant researchers, senior environmental officials from each of our states (heads of key agencies or the deputies), several senior officials from local agencies, key EPA Region 9 staff and senior management (including the RA and DRA), OAQPS staff and ORD (including Joel Scheraga). The intent of the workshop is not just to share information, but to come together and identify priority program concerns at a state and local level and key needs for future research and development. As a result of the Region's initiative, ORD will gain access to key state and local stakeholders that would otherwise be difficult to obtain. All parties will gain from the exchange of ideas and perspectives, and researchers will have a unique opportunity to learn the critical needs of those responsible for implementing environmental programs.

Recommended Best Practice:

- Encourage senior ORD officials (NPDs, lab directors) to regularly visit regions.
- Increase ORD partnerships with Regions to better obtain state and local perspectives and input on research needs and emerging issues.
- Leverage STAR grantees to contribute input to priority program implementation challenges.

Region 10

Title: Tribal Fish Consumption Survey Software and Supporting Documents

Best Practice: End-User (Tribal) Oriented Participatory Research. Often successful interactions with Tribes require a long term effort and personal interactions, and such was the case with this project. The success of this project depended on the sustained commitment of the individual scientists, as well as their management. Over an extended time period (more than five years), the principal ORD scientist and the Region scientist maintained good, ongoing communications with one another, as well as with the Tribal participants. Both the ORD scientist and the Region 10 scientist had the support to travel for face-to-face meetings with the Tribe, and provided timely and culturally appropriate responses to the Tribe.

Background: Calculation of a standard which is protective for Tribal members who consume fish harvested from the water body includes an appropriate fish consumption rate. In Region 10, three well conducted Tribal fish consumption studies indicate high consumption rates, as well as, wide variation of consumption rates between various Tribes. Experience with these studies revealed the high personnel and fiscal costs required to conduct this type of work. However, in other all cases no appropriately

documented fish consumption rates are available. Neither Tribes nor Region 10, have the expertise or resources to collect such data. Additionally, as sovereign Nations, Tribes are not readily amenable to non-Tribal inquiry regarding their cultural practices, including fish consumption, and are concerned about the proprietary nature of their data.

Science: Computer assisted personal interview (CAPI) software was developed to aid Tribes in collecting their own fish consumption data. The format of the survey instrument was modeled after the previously successful, paper-based, Tribal fish consumption surveys. CAPI offers advantages over paper surveys in that it facilitates interview flow and consistency, enhances data quality control, consolidates data from multiple interviewers, facilitates data archiving, and can be used to conduct data analyses. ORD epidemiologists and statisticians assured that the survey process followed scientifically acceptable practices, including state of the science practices regarding fish consumption surveys. ORD contactors provided software coding. The Region 10 scientist assured that the software output was compatible with data needs as described in the US EPA Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (EPA-822-B-00-004). Tribal beta testing and pilot testing, assured that the CAPI could be used effectively, and that supporting documentation conveyed information to users and survey participants in a culturally appropriate and effective manner.

Outcomes:

- (1) The tool allows Tribes to do their own fish consumption surveys, and is more cost effective than hiring consultants to perform the work.
- (2) Tribes are able to maintain proprietary of their cultural information.
- (3) Region 10 is confident that data can be collected and documented in a manner that meets the data quality needs of the Clean Water Act.
- (4) Tribes in other EPA Regions are now evaluating the CAPI software for use in development of their human health ambient water quality standards.

ORD/NPDs

Title: Future Midwestern Landscapes Study Focuses on Ecosystem Services

The Midwest region is critically important in supplying national and global demand for food, fiber, and fuel. Midwestern landscapes also play essential roles in the supply of water to homes and farms, recreation, flood control, and a host of other benefits essential to the quality of life.

The rapid growth of the biofuels industry, which uses crops and other biomass to make liquid fuel, is causing changes in agricultural practices and land uses across the U.S., and most strikingly in the Midwest. EPA's Regional offices are interested in the long-term environmental implications of these changes. This study will examine projected changes in landscapes and ecosystem services in the Midwest. Given its immediate influence, biofuel production will be studied as a primary driver of landscape change.

The study goals are to:

- Understand how current and projected land uses affect the ecosystem services provided by Midwestern landscapes.
- Provide spatially explicit information that will enable EPA Regions and Programs to articulate sustainable approaches to environmental management.
- Develop web-based tools depicting alternative futures so users can evaluate trade-offs affecting ecosystem services.

For a large area of the Midwest, researchers will work with decision makers and use economic and spatial modeling tools to construct alternative landscapes that reflect different assumptions about biofuels policy, technology, and landscape management over the next 10-20 years. Some of these will be at the scale of the entire study region, others at subregional or watershed scales.

Title: Land Research Program Regional Involvement in Research Planning

In 2005, five Regional Research Advisory Workgroups (RRAWG) were formed to help develop and prioritize research needs as well as perform other coordinating functions between ORD and the Regions related to site cleanup. These workgroups consist of about 25 Regional staff along with OSRTI staff, liaisons from ORD's Superfund and Technology Liaisons in the Regions and ORD staff from the Laboratories and Centers. In 2007, they are currently revising their needs and reviewing ongoing ORD research.

There are five advisory workgroups:

1. Sediment: ecological effects, modeling, sampling, monitoring, and remedy-specific research; Superfund Sediment Resource Center; Ecological Risk Assessment Center.
2. Ground Water: MNA, dense non-aqueous phase liquid (DNAPL), and vapor intrusion (VI) research; Ground Water Technical Support Center.
3. Engineering, Containment, and Soil Treatment: soil containment and treatment; landfill covers, gas, and liners; Engineering Technical Support Center.
4. Site Characterization and Methods: sampling techniques, analysis methods, and statistics; Monitoring and Site Characterization Technical Support Center; Environmental Photographic Interpretation Center.
5. Human Health Risk Assessment: all research conducted through the National Center for Environmental Assessment (NCEA).

Each workgroup produces a prioritized list of research activities of importance to the Regions and reviews current ORD research. The Land RCT

received the prioritizations of the regional workgroups and evaluated the higher priority topics. The higher priority research from each workgroup (typically 4–6 research needs) were evaluated by the RCT, and ORD wrote a response for each of these, which was either (a) a shift in the research program, (b) confirmation that current research addressed the need, or (c) the RCT was unable to address the need. For most of the higher research needs, the RCT was able to shift the research program or the current program addressed the need.

SESSION: NON-RESEARCH

Region 1

Title: Lakehurst Acres, Maine Drinking Water Crisis

Best Practice: Open Door Business Policy. Recognizing that regional technical support from ORD may not typically fall out of the current ORD MYPs research agenda and that it is in the agencies best interest to collectively look beyond our core routine research responsibilities in our respective programs to partner in arriving at solutions to meet our agency mission cooperatively on an as-needed basis. This should be common practice with some guidance on how to elevate a significant need.

Background: The Lakehurst water municipality had a problem with their drinking water supply in that they knew they had levels of arsenic that needed to be removed. When they incorporated a remedial measure to remove the arsenic, the chemical process resulted in a change of pH that enhanced the corrosive nature of the water and increased the water solubility of lead from pipe appurtenances into the water supply. The lead levels sampled at taps measured more than 200 times the federal standard. This raised the immediate concern of lead poisoning to the public that utilizes this resource. ORD NRMRL was contacted to see if they could assist with a solution.

Science: ORD was contacted and EPA Region 1 along with the Maine Dept. of Health and Human Services asked for some immediate assistance with regards to the crisis. Early technical assistance identified the problem and determined what had caused the spike in pH and the high lead levels. The water utility with assistance from ORD then convened an expert panel with contractual support that provided the best course of action to take to remediate the problem. ORD then took the initiative to design a research project around this current technology support to engage research dollars into finding the best key treatment practices based upon trial demonstrations. This also resulted in the implementation and transfer of an air stripper technology to the site.

Outcome:

- (1) Significant reduction in Lead levels
- (2) There is an agreement between ORD, State of Maine, and Region 1 to continue the monitoring of this water supply until the water is deemed safe and drinkable.

- (3) The site has been designated a research pilot study which enabled ORD to locate an air stripper to the site to help reduce the pH of the water supply and help mitigate the high lead levels.
- (4) ORD will continue to look at operational and technology solutions with the State and Regional partners in hopes of identifying a solution that may be utilized in other water supplies high in arsenic.

Title: Building Statistical Capacity in Support of Cross Regional Programs

Background: Region 1 determined through the Regional Science Council science survey that statistical support was priority need across regional programs. Staff and managers eluded to the lack of technical credibility in ROD's, Site assessment reports; QAPPs, and in permit development. The region needed to first, secure statistical technical support for the immediate near term to help meet regional staff need, and second, determine the best statistical software available that would be easy to use for training and that is cost effective.

Science: The region called on ORD for advice on how to meet our statistical support need for both the short term and the long term. For the short term, ORD provided the regions with a statistician expert under contract that would respond to individual requests for statistics support. Numerous regional staff utilized this expertise for their respective program responsibilities. In addition, the Regional Science Council asked this expert to provide a review and recommendation of possible statistical software options the region might evaluate to serve as an in-house training module so that regional staff could help each other learn the fundamental statistical models necessary to accomplish their jobs with credibility. Recommendations were made and the RSC developed a training module that was used to educate regional managers and staff.

Outcomes:

- (1) Significant increase in the use of sound statistical practices in meeting the regulatory responsibilities of the agency by the region.
- (2) New training module is now available for training others on statistics
- (3) Short term need was met with the help of ORD technical expertise
- (4) Work continued without any loss of credibility in a timely manner.
- (5) Statistical capacity achieved through training of over 75 regional employees.

Title: Superfund Technical Support Centers (TSCs)

Theme: Research and Technical Support and Technology: A cross-theme example.

Best practice: ORD's Superfund Technical Support Centers provide expert Technical Support to the Regions to solve especially complex problems at waste sites. Additional results include ORD Research and publications as well as Technology Development.

Background: For approximately 20 years, the ORD Superfund Technical Support Centers have been cited by both the Regions and OSWER as one of the most valuable resources for the regional Superfund and RCRA staff. The importance and relevance of the TSCs is indicated by joint funding by OSWER, ORD, and the Regions. ORD has acknowledged how the TSCs have enabled ORD to publish waste-related Research, and to identify, develop and provide Technologies to solve environmental problems. The TSCs have been cited in the “45 Day Study” as a successful model for other Regional support programs. The value of the Superfund TSCs and STL Program have been highlighted in many forums, including:

- Annual Reviews of Waste Research conducted by ORD, OSWER and the Regions
- 45 Day Study (2004)
- Board of Scientific Counselors (BOSC) meeting (Dec. 2005)
- ORD’s Science To Outcomes efforts (early 2006)
- ORD/OSP’s visits to all 10 regions (early 2008)

Science: The Superfund Program makes technically accurate and scientifically defensible decisions at every step in the Program. Technical Support from the TSCs enables ORD experts to assist the Regions in answering and evaluating answers to fundamental questions such as how to characterize waste, the fate and transport of waste in ground water, what technologies can be used and or tested in the field to clean up sites. What models are available? Are they being used correctly? Can new technologies be developed to address the identified clean up problems, say at a DNAPL site.

Outcomes

In Region 1 specific examples of where ORD support played a critical roll in Superfund decision-making would include such sites as:

Industriplex – The ROD anticipates significant cost savings because of the research conducted by ORD resulted in a lower cost remedial technology being selected. ;

Olin Chemical - chemical fingerprinting of contamination led to the listing of the site and identification of a PRP.

SRS - DNAPL source delineation resulted in a ROD that has an active clean-up, a positive environmental outcome, instead of a TI waiver.

For ORD, these joint efforts have resulted in significant research publications in ground water and soil characterization/remediation as well as technology development. Some examples would include ground water sampling protocols, fate and transport modeling, and XRF metal analysis of soils. Remedial Technology development includes such areas as natural attenuation, Permeable Reactive Barriers, Phytoremediation, chemical oxidation and thermal technologies.

Region 2

Title: Evaluation of Toxicity of Chemicals at Superfund Sites

Best Practice: ORD’s technical support to the Regional risk assessors.

Background

At Superfund sites we typically find a large number of chemicals based on prior disposal practices at the facility. As part of the risk assessment process, we evaluate the toxicity of these chemicals to aid in the determination of the risks from exposure to receptors including the child and adult resident and the industrial worker where the property continues to be used for industrial purposes.

To assure consistency in risk assessments we use a hierarchy of toxicity values that rely on the Integrated Risk Information System or IRIS as a primary source of toxicity information. The second tier is the Provisional Peer Reviewed Toxicity Values. The third tier are other data sources including the Agency for Toxic Substances and Disease Registry Minimal Risk Levels or the California Environmental Protection Agency values with review by EPA's National Center for Environmental Assessment Superfund Technical Support Center.

Absent these toxicity values, we typically qualitatively discuss the results in the risk assessment. Among communities this may be of special concern since we can not definitely indicate whether these chemicals pose a risk or the level of the risk from exposure.

Technical Support

The regions have benefited from the on-going coordination and work with the staff from the IRIS program, the Superfund Technical Support Center, and the IRIS chemical managers for the individual chemicals. Through this coordination, the regional risk assessors have been able to identify chemicals where toxicity values are necessary (IRIS nominating process); coordinate with the Superfund Technical Support Center in Cincinnati (part of the National Center for Environmental Assessment) to identify whether a surrogate value may be available to include in the risk assessment thus providing a potential indication of the risks from exposure; nominate chemicals for Provisional Peer Reviewed Toxicity Values and better understand the use of toxicity information to inform the risk characterization. The Superfund Technical Support Team is also funded by OSRTI within OSWER.

Outcome

This approach has been a success for Region 2 since through this coordination we are able to obtain important information on the toxicity of chemicals that can be included in the risk assessment where values are available or quantitatively in the risk characterization where toxicity information is not available. Absent this support, the regions would need to conduct their own evaluations, spend time arguing about toxicity values with Potentially Responsible Parties, potentially conduct peer-reviews of the toxicity values developed, and have the potential for inconsistencies across Superfund sites. In the absence of toxicity information, the risk assessor may not be able to address specific community concerns regarding exposure to these chemicals.

One specific example was the evaluation of the toxicity of PCBs where NCEA through the IRIS program was able to develop a peer-reviewed toxicity value for inclusion in many significant Superfund sites. In addition, we and other regions benefited from the expertise in ORD in addressing comments on the toxicity of PCBs submitted by the PRPs during the comment period on major Superfund decisions in the region.

In the absence of IRIS and the Superfund Technical Support Centers each regional risk assessor would need to spend time reviewing the scientific literature, reviewing toxicity values developed by other Agencies (i.e., ATSDR, Cal-EPA), and addressing comments received by Potentially Responsible Parties that may suggest an alternative toxicity value(s) or submit new studies. In addition to the regions, our state co-regulators may also be required to conduct similar research activities to develop new toxicity values.

The current practice provides a consistent approach and access to toxicological expertise that is essentially to making of informed decisions. Region 2 advocates the continuation of the close coordination between the Regions and the IRIS program and the Superfund Technical Support Centers in NCEA and OSRTI in OSWER.

Title: Evaluation of Exposure Parameters for Use in Risk Assessment

Best Practice: ORD's publication of handbooks, manuals, compilations, literature reviews, and state-of-the-science reports.

Background

At Superfund sites we typically evaluate the exposures to a range of receptors including the child and adult resident and the industrial worker where the property continues to be used for industrial purposes. The Exposure Factors Handbooks provide an excellent resource in the evaluation of these exposures, especially where the current Superfund defaults do not specifically address the exposure parameters at a specific site i.e., ingestion of vegetables, game, etc.

Science

The compilation of the available studies in a peer-reviewed, easy to follow format that provides the range of studies along with recommended values has been invaluable to developing site-specific risk assessments for several exposure pathways. We have also found that the coordinators for the Exposure Factors Handbooks, Jackie Moya and John Schaum in NCEA have always shared information on a variety of exposure parameters with the regional and state risk assessors, have invited comments from Risk Assessors across the country, and have attended Regional Risk meetings and made presentations. This outreach provides an important mechanism for EPA and State risk assessors to stay aware of the latest exposure information and to share studies that they have been involved in.

Outcome

In the absence of the EFH the potential exists that each region would develop their own exposure variables and there would be inconsistencies across the Region that are not

based on the site-specific information. This would also involve a significant investment of individual risk assessors time to compile this data which would magnify based on the number of risk assessors across the Agency.

Title: Development of Analytical Technique for Tentatively Identified Compound

Best Practice: ORD Technical Support to Regional Remedial Project Managers

Background

Region 2 as part of an investigation of groundwater contamination at a Superfund site identified a tentatively identified compound (TIC). Region 2 worked with the USEPA Las Vegas laboratory and also NJDEP and the PRPS in determining the probable structure of the unknown substance, which was consistent with a chemical by-product known to be present in the Potentially Responsible Party wastes deposited at the site in 1971. This substance has been identified as a mixture of isomers of 4-cyano-1,2,3,4-tetrahydro-a-methyl-naphthalene-acetonitrile (THNA) and 4-cyano-1,2,3,4-tetrahydro-1-naphthalene-propionitrile (THNP). Because these closely related compounds are formed as condensation by-products of the styrene-acrylonitrile co-polymerization process and are composed of one part styrene and two parts acrylonitrile, they are collectively referred to as styrene-acrylonitrile (SAN) trimer.

Technical Support

Initial analyses by the NJDEP laboratory, using an analytic method designed for pesticides (USEPA Method 507), indicated the presence of a non-target compound that could not be tentatively identified, particularly in the April 4, 1996 sample from well at a Superfund Site in New Jersey. Subsequent analyses by laboratories of the NJDEP, NJDHSS, USEPA (in Cincinnati, Athens, and Las Vegas) and the Potentially Responsible Party confirmed the presence of an unknown compound (Richardson et al., 1999).

Outcome

This contaminant was found in low part-per-billion levels in the two wells already known to have been impacted by a local Superfund site. The existing treatment system at these wells was not effective at removing the contaminant. Because this area is part of a Superfund site, the Environmental Protection Agency directed the Potentially Responsible Party, to install a carbon treatment system on the two contaminated wells to supplement the existing treatment. The new carbon treatment system removes the contaminant to non-detectable levels. The Environmental Protection Agency, with the National Institute of Environmental Health Sciences, is overseeing long-term chronic studies to determine if this contaminant causes cancer. Recently, EPA's National Center for Environmental Assessment, Superfund Technical Support Center, also provided support to Region 2 in the review of toxicity data developed by the National Center for Environmental Assessment.

In the absence of the input from the Las Vegas Laboratory in coordination with NJDEP and the Potentially Responsible Party, it would not have been possible to identify this

chemical of potential concern and address community concerns. The identification of the chemical also provided information necessary to develop a treatment plan for the groundwater. The identification of the chemical also led to the toxicity testing of this chemical which is ongoing through the National Institutes of Environmental Health Sciences.

Title: Availability of Expertise to Support Decision Making

Best Practice: ORD's Support to Regional Decision Makers

Background

In many cases the Regions, including Region 2, are faced with the need to understand scientific information during the development of a Remedial Investigation/Feasibility Study, while conducting sampling regarding complex environmental issues in a short period of time. In some cases, this information is needed to address comments from Potentially Responsible Parties and communities.

Technical Support

The staffs in the various ORD laboratories have freely shared their expertise in addressing these questions through presentations at the RATS teleconferences, through direct response to questions, and through development of tools useful in decision making. Examples of this assistance include:

- Addressing specific chemical questions regarding derivation of toxicity values, responding to the submission of new toxicity values developed by the Potentially Responsible Parties, and responding comments.
- Providing expertise on the review of models at contaminated sediment and groundwater sites.
- Reviewing statistical analyses and helping to develop Probabilistic Risk Analyses.
- Providing Risk Assessment Forum analyses of emerging scientific issues including the guidelines that are needed for the development of risk assessments including mutagenic mode of action chemicals.
- Aiding in structure activity analyses to understand chemical toxicity
- Expertise in epidemiological principles that may be needed to address specific investigations conducted at sites
- Learning about emerging topics such as genomics, nanoparticles, where white papers and presentations at meetings have been invaluable in understanding the science behind these areas.
- Participating in multiyear plans.

Outcome

Tremendous scientific advances are occurring in the ORD laboratories and other areas. In the Regions, the scientists are primarily involved in the application of science. With the myriad of new advances it may be difficult to keep current. The various ORD documents are essential in learning about new scientific advances. In addition, the access to the scientists within ORD through seminars, etc. are essential in maintaining the

scientific dialogue between the Regions and ORD so that the risk assessors can learn about new advances while at the same time ORD can learn about regional needs.

Title: Evaluation of IRIS Toxicity Values

Best Practice: Regional involvement in the IRIS review process

Background

Region 2 and other regions participate as consensus reviewers for the IRIS chemicals being developed by the National Center for Environmental Assessment. We have found the IRIS consensus process most valuable in understanding the toxicity of the chemical and discussing the toxicological information and the application of the Agency's guidelines. In addition, the IRIS staff has also provided training to the consensus reviewers and chemical managers that is invaluable in keeping up with the latest developments in toxicology and their applications.

Science

IRIS remains an integral part of the Superfund process since the toxicity values in these chemical assessments are used in decision making. Participating as an IRIS consensus reviewer, provides an important way of evaluating the chemical early in the process, establishing an understanding of the chemical data, and providing a forum to discuss the information before the chemical file is finalized.

Outcome

Region 2 has found its involvement in the IRIS consensus a valuable one. Unfortunately, the participation of the other regions has been limited. While we recognize the limitations of staff time, we wanted to highlight the important insights provided by the review of the chemicals where comments can be addressed early in the process. In addition, the discussions always provide an important mechanism for sharing of the latest toxicity information on specific chemicals. It would be helpful to have more regions participate in the review of the chemicals. Without this participation the regions lose the opportunity to participate in the IRIS process and provide comments on chemical files early in the process. The opportunity to share toxicological insight on specific chemicals is also lost.

Title: ORD-AED's Coastal Condition Research and Technical Support Associated with EPA's National Coastal Assessment (NCA)

Best Practice: ORD's development of decision support tools, including outreach and training of Regional stakeholders/users/partners.

Background

The Clean Water Act (CWA) Section 305(b) directs states to assess the overall quality of the waters within their state, determine whether that quality is changing over time, identify problem areas and management actions necessary to resolve those problems, and evaluate the overall effectiveness of CWA programs.

However, each state uses its own methods and sampling designs making the comparison of data between states (e.g., for regional or national assessments) difficult. In addition, the traditional, targeted, ambient water quality monitoring of states may not capture significant water quality problems.

Research and Technical Support

AED's condition-related research has aimed to build the scientific basis, and the local, state, and tribal capacity, to monitor for the status and trends in the condition of the Nation's aquatic ecosystems, with an initial focus on estuaries.

As part of the first (CCR) and second (CCR II) condition reports, AED staff has worked closely with the numerous regional NCA partners to identify appropriate coastal indicators of condition; and facilitate collaboration and technology transfer through the design and transfer of an electronic reporting website. This tool includes computational and statistical tools, and a compendium of assessment reports as well as the computational and visualization tools used to create them, and the data upon which they are based.

Outcome

Based on the data collected as part of the NCA monitoring effort, and using the computational and visualization tools developed by AED, Regional partners were able to evaluate previously non-comparable data. For example, fish tissue data was extrapolated to different North Eastern states and demonstrated various declines or increases in fish tissue concentrations of specific pollutants, including mercury. Such information can be utilized to target monitoring (by pollutant and state) and remediation efforts (by pollutant and state). In addition, the analysis tools may support the development of more consistent fish consumption advisories for various fish species and pollutants along the eastern seaboard.

Region 3

Title: Washington Aqueduct NPDES Permit Reissuance

Best Practice - ORD Team Support for Regional Regulatory and Policy Actions

Background - The Region 3 Water Management Division (WMD) was dealing with the request from the D.C. drinking water authorities for re-issuance of the permit for discharge of sediment from the Washington Aqueduct reservoir. The Aqueduct is the major source of drinking water for Washington, D.C. and surrounding municipalities. Water received from the Potomac is processed after sediment is precipitated out and periodically the accumulated sediment must be discharged back to the river. The action was politically charged due to environmental concerns about the impact of the sediment and chemicals used to settle out the sediment, on aquatic life, especially the Atlantic sturgeon, which is listed as an endangered species. It was also highly politicized due to the feelings of a congressman who felt if an endangered species was threatened in his

rural district, lacking the political clout of D.C., there would be no way EPA would approve the request.

Science - The Region 3 RSL was contacted by the WMD for assistance in technical support in reviewing the discharge permit application, especially a contractor generated ecological risk assessment in support of the permit. Technical expertise in aquatic toxicology testing, endangered species assessment, and sediment modeling were the key needs identified. A team of ORD scientists were assembled for a conference with the WMD to identify the key issues. Through a series of follow-up calls, document reviews and discussions directly with the contractor, the assessment was significantly refined to enhance the validity of the scientific foundation of the assessment, especially the modeling approach and assumptions used, and the toxicity testing.

Outcome - Based upon the input of the ORD scientists over several months and numerous interactions of the assessment, the Region ended up with an ecological assessment that they felt was scientifically valid and gave them the comfort level needed to move forward in the re-issuance of the permit.

The WMD was awarded a Bronze Medal for their efforts and three of the ORD scientists intimately involved in the project were included in the award.

Title: Regional Science Workshop on Headwater Streams and Isolated Wetlands

Best Practice - Using a Regional Science Workshop to identify regional research needs and incorporate them into the planning process and multiyear plan.

Background - Headwater streams/isolated wetlands was identified as a priority topic and candidate for the annual selection of themes for the OSP sponsored Regional Science Workshops. These workshops are meant to focus in on high priority regional science needs and provide a forum to bring regional staff and ORD scientists together for extensive discussion of these needs, an understanding of the available science, and provide a mechanism to develop collaborations for addressing these needs.

Science - Headwater streams and isolated wetlands are valuable resources, important in a wide range of functions in watersheds, such as nutrient control, amphibian and invertebrate habitat, hydrologic conductivity, flood control, and water purification. The functions of these resources in watersheds often is not recognized and appreciated by the general population, planners, and others responsible for land development and management. A research strategy was needed to fill the gaps in the science regarding the importance of these resources.

Outcomes - The Regional Science Workshop brought together scientists from the ORD, technical staff from EPA Regions 3 and 4, and their partnering state agencies. Their shared goal for the workshop was to describe the state-of-the-science on headwater streams and isolated wetlands. They also worked to explore opportunities to fill science gaps in a way that will support the educational, policy, and regulatory activities needed to protect these resources. The format and structure of these workshops varies, but an

emphasis in this workshop was to identify the regional needs and integrate these needs into the ORD Water Quality Multiyear Research Plan (MYP).

One of the sessions focused on developing a science-based response to the recent U.S. Supreme Court ruling on the Rapanos and Carabell cases. EPA ORD scientists prepared a technical manuscript on this topic, in cooperation with EPA's Office of Water Wetlands Division and other academic partners. It is tentatively titled, "*The Effects of Headwater Streams and Adjacent Wetlands on Navigable Waters: Information Needs Following the U.S. Supreme Court's Rapanos and Carabell Decisions.*" The authors evaluated the feasibility of using ecologically based classification systems to categorize headwater streams and adjacent wetlands so as to distinguish between those that meet jurisdictional legal tests and those that do not.

In addition, ten ORD scientists from across ORD participated in the workshop and utilized the information obtained to provide the regional piece in the research strategy submitted for the MYP. It was the first Workshop used for this purpose and provided a valuable, timely forum to concisely develop a regional research component for the MYP.

Region 4

Title: Assessment of Human Health and Environmental Risks from Polychlorinated Biphenyls (PCBs) Released from the EX-Oriskany following Deployment as an Artificial Reef

Background: The United States Navy and the state of Florida planned to deploy the ex-Oriskany, a Korean-War-era aircraft carrier, as an artificial reef in the Gulf of Mexico. Because the Navy planned to leave regulated PCBs onboard the vessel, it was necessary to obtain PCB-disposal approval prior to sinking the ex-Oriskany. EPA may issue a PCB disposal approval only if it finds that the disposal action will not pose an unreasonable risk of injury to human health or the environment.

Science: To evaluate the potential transfer of non-liquid PCBs to the marine environment and the subsequent risk that they might pose to human and ecological receptors using the new reef, the Navy performed leaching studies of different on-board PCB containing materials followed by fate and transport modeling of the leaching results. Prior to issuing the permit, it was necessary for EPA Region 4 to validate the results of the Navy studies and models. EPA Region 4 asked the Office of Research and Development (ORD) to review the model, risk assessments, and other supporting documentation for the overall factual and conceptual soundness of approach and methods used, as well as the validity of results and conclusions. Scientists in ORD's National Exposure Research Laboratory and National Health and Environmental Effects Research Laboratory provided the expertise to support Region 4.

Outcomes: ORD's technical advice regarding the information generated by the Navy was instrumental in Region 4's issue of the Approval to Dispose of Polychlorinated Biphenyls (PCB) in February 2006.

Region 5

Title: Excessive Air Emissions of Acrylonitrile and 1,3-Butadiene from Ohio Facility

Problem Statement: The State of Ohio needed data and information to rebut the position of the facility that air emissions present no hazard.

Background: The Lanxess company in Addyston, Ohio processes acrylonitrile and 1,3-butadiene in the manufacture of polymers. Monitoring by the State of Ohio found air concentrations of the two compounds from the facility to be above standards. The company disputed the finding, and took the position that the standards had insufficient scientific basis.

Region 5 staff connected with risk assessment and toxicology staff at ORD to develop documentation for the State of Ohio finding. ORD was able to provide high quality documentation of toxicity and risk.

Positive Outcomes: Because of the prompt delivery and high quality of the toxicology and risk documentation provided by ORD, the State of Ohio was able to negotiate a settlement aimed at a reduction of the harmful emissions.

Regional and ORD Staff Involved: Region 5: George Bolweg, Air Division
ORD: Diana Wong, Apparna Koppikar and Jennifer Jinot of the ORD IRIS program.

What Made the Project Successful: The expert scientists at ORD who provided documentation of the toxicology and risk that were of such high quality that the facility abandoned its resistance to eliminating the unacceptable levels of air pollution.

Region 6

Title: Providing a Briefing for Regional Project Officers and Grants Specialists on Human Subjects Research

Best Practice: Help for the Region in Human Subjects Research Issues. Providing support and partnership in routine, but difficult to understand, issues.

Background: The Common Rule was signed by 17 different Federal Agencies in 1991, but its requirements did not trickle down to the scientists, project officers, and grants specialists until much later. By 2005, the Regions were asking about whether we had any projects that fell under the Common Rule requirements for Human Subjects Research. None of the Regional Personnel had been briefed on these requirements until an ORD/Regional Workshop in late 2005.

Science: ORD's Human Subjects Research Review Official (HSRRO) and several other ORD personnel participated in the September, 2005, workshop with Regional personnel

to raise consciousness about the Common Rule and EPA Order requirements in the area of Human Subjects Research. After the Workshop, Dr. Richard Hermann of NHEERL volunteered to come out to Region 6 (at ORD's travel expense) to present a several-hour briefing to Regional staff (project officers and grants/contract specialists) on the requirements of HSR and the kinds of things to look for in grants and contracts.

Outcomes: This was very eye-opening to almost all staff, who immediately thought of possible grants where the HSRRO needed to be involved. At least two such projects were eventually forwarded through the HSRRO process, where they were approved. Dr. Hermann's visit was really the start of a process to be installed in the Region to deal with future issues of this sort.

Title: Laboratory Infrastructure Study

Best Practice: Study of ways to more efficiently run EPA laboratories.

Background: Recent budget cuts forced the question of whether EPA needed to have all the ORD, Regional, and Program Office labs. Management quickly came to the conclusion that all the labs were actually needed, but formed a committee to study ways of reducing the operating costs for the labs across the Agency.

Science: A committee headed by Dale Pahl of NERL was commissioned to look for ways to cut operating costs at EPA's laboratories. The committee included members from all the different types of labs, including RS&T Directors from the Regions. The group studied a wide variety of ways to cut costs.

Outcomes: The report is currently in draft form, but members of the committee say they have never seen such a cooperative spirit throughout all the labs.

Region 7

Title: Regional Research Partnership Program

Problem Statement

Implementing Homeland Security programs and processes is becoming an increasingly critical issue for all of the Regions. Tools and expertise are needed to fully implement Regional plans.

Goal

- Gain added knowledge of the National Homeland Security Research Center's objectives and research agenda
- Gain a relationship with the NHSRC that will provide Region 7 with tools and expertise we currently do not have.

Outcomes

- Participant is now working full time on Homeland Security efforts w/in R7 including a cooperative project with ORD (Water Sentinel)
- Valuable connection w/ NHSRC and their expertise and tools.
- Valuable feedback mechanisms set up between NHSRC and R7 to discuss Regional needs and vice versa

EPA Contacts

ORD contact:: Jon Herrmann

Region 7 contacts: Norman Rodriguez – RRPP participant

And Brenda Groskinsky – Regional Science Liaison

Region 8

Title: Region/ORD Science Topic Workshop on Wetlands and the Evaluation of Ecosystem Services in a Watershed Context

Background:

The Regional Science Workshop on Headwater Streams, Isolated and Adjacent Wetlands in the Western States will be a continuation of the Headwater Streams and Isolated Wetlands Workshop held in Region 3 during the summer of 2006. This workshop will bring together Utah State agency staff, U.S. Environmental Protection Agency (EPA) Regional staff, EPA Office of Research and Development (ORD) scientists, and their partners in science. It will explore how science can be applied to help protect and restore wetlands and the valued ecosystem services that they provide to communities. It will review the understanding about the environmental significance of these systems, their functional attributes, and the factors that place them at risk. Together, workshop participants will explore the management and science programs that currently are being implemented to help sustain and restore the wetlands of the Great Salt Lake. Special emphasis will be placed on the consideration of market-based approaches for attaining environmental goals.

Expected Regional Application and Environmental Outcome:

During a post-workshop special session, the EPA-RARE funded research study entitled, "Evaluating the technical feasibility of integrating wetlands into a water quality trading program for the Great Salt Lake: An alternative futures approach." The research project is part of a new interagency coordination effort called the Great Salt Lake Wetland Goals Project. The Wetland Goals Project is linked to Utah's Watershed Restoration Initiative and the Great Salt Lake Water Quality Steering Committee.

The desired outcomes of the workshop are: (1) an inventory of science needs for the evaluation of wetland ecosystem services; (2) a general plan for research to support regional and state program needs; and (3) the development of an informal technical advisory committee for the "Great Salt Lake Wetland Alternative Futures Project." Specific research studies and products that can help practitioners make better informed decisions on wetland policy and individual projects will be explored and lessons learned at the workshop will be implemented into ORD's Ecological Research Program.

Title: Estrogenic Endocrine Disrupting Chemicals

Background:

In October 2004, a news story in the Denver Post alerted the public to a finding of intersex fish found in the South Platte River and Boulder Creek by biologists in 2002. This led to research being conducted by University of Colorado-Boulder. As a result, the Region 8 NPDES Program funded two years of research to investigate sites upstream and downstream of a waste water treatment plant (WWTP). The results of the first year showed evidence of reproductive disruption in native white suckers which includes the presence of vitellogenin in juvenile fish and sex ratio-skewed towards females downstream of the WWTP,

Region 8 decided to fund this work for another year to integrate lab and field assessments of actual and potential impacts of endocrine-active WWTP on fish reproduction. These preliminary results along with USGS interest and Denver Metro interest has lead to the formation of the Consortium for Research and Education on Emerging Contaminants.

Technical Assistance:

The Office of Research and Development, National Exposure Research Laboratory (NERL) in Cincinnati, Ohio provided technical training to biologists from the EPA Region 8 Laboratory for measuring the level of vitellogenin (Vg) gene expression in male fathead minnows. During this short term detail as part of the Regional Research Partnership Program, the EPA Region 8 Laboratory personnel received on-site training in exposure methods, tissue sampling and preservation, RNA isolation, and quantitative polymerase chain reaction (QPCR) methods associated with the vitellogenin gene expression assay to aid in the detection of endocrine disruption.

Expected Regional Application and Environmental Outcome:

This detail provided the EPA Region 8 personnel with an excellent opportunity to learn first hand how to perform both the exposure and genetics techniques necessary to analyze for these endocrine disrupting compounds and found ORD scientists extremely knowledgeable and enthusiastic. Region 8 staff also got a strong sense that a continued relationship of support and collaboration with NERL Cincinnati would continue well into the future.

The Region 8 Laboratory intends to use the technology developed by the NERL laboratory to increase its analytical capabilities and perform work that will benefit the monitoring and assessment, NPDES and pretreatment programs within EPA Region 8. Using these techniques, the laboratory will begin work on a long-term wastewater treatment plant project in collaboration with various internal EPA programs along with external groups including the University of Colorado, USGS, and the Division of Wildlife. This work is scheduled to begin in the Fall 2007. The goal of this project will be to get a better understanding of the effects of these endocrine disrupting compounds and determine whether any additional regulatory and/or treatment options will be necessary for the future.

Title: Solving Environmental Problems through Collaboration

Background:

Through the Regional Research Partnership Program, ORD's National Risk Management Research Laboratory has provided technical assistance and training to EPA's Pollution Prevention and Toxics Program regarding sustainability tools that are available to Region 8. Many federal and state land management agencies have requested this type of assistance and with our greater understanding of systems metrics and environmental management for sustainability.

Expected Regional Application and Environmental Outcome:

Region 8 is better prepared to offer these sustainability tools to the land management agencies for their decision making purposes. This partnership effort is being expanded to explore developing sustainability indices to protect the landscape and ecosystems of Great Sand Dunes National Park and Preserve. Another outcome of this partnership between EPA Region 8 and NRMRL's Sustainable Environments Branch was a one day training workshop in EPA Region 8 on Systems Metrics and Environmental Management for Sustainability with participants from EPA Region 8, ORD NRMRL, Great Sand Dunes National Park, The Nature Conservancy and the National Park Service.

Through mentoring with ORD scientists, as part of this Research Partnership, new and effective perspectives on collaborative problems solving were achieved. This expertise will be shared within the Region and applied to their community-specific work. Region 8 identified this expertise as a strategically important priority, especially in their public lands focus area. The expertise gained by this detail will assist the Region with their efforts of providing guidance to public land managers, citizen groups and other government entities.

Region 9

Title: Arsenic MCL Compliance for Small Drinking Water Systems

Background:

Arsenic is a well-known cause of cancers and other serious diseases. To address this issue EPA revised its drinking water MCL downward from 50 ug/L to 10 ug/L in January, 2001. This rule addresses a substantial risk, but requires potentially substantial costs for compliance. Our major concern for implementation of this regulation was large-scale non-compliance due to lack of affordable treatment and waste disposal approaches.

In addition, about 90% of systems affected by the rule are small ground water systems serving populations of 3,300 or less. In the past, these systems have had fewer regulatory requirements than larger systems. Treatment and operational costs tend to dominate their concerns. Source substitution or blending is frequently not an option. EPA Region 9 had a substantial number of smaller systems subject to the new rule with an immediate need

for practical technical assistance to implement affordable arsenic treatment options to obtain timely compliance.

Research Conducted:

ORD's drinking water research program in Cincinnati had a number of pilot arsenic water treatment systems out in the field undergoing testing, specifically for application to small water systems. Small package units suitable for community systems or household applications with high water recovery, minimal operation and maintenance requirements, and relatively low costs, were being evaluated. ORD units were also being developed for a range of typical water quality situations.

Regional Application and Environmental Outcomes:

Region 9 worked internally with other Regions, the Office of Water, and ORD to provide outreach and implementation assistance on a broad scale to small water purveyors.

Region 9 also collaborated with ORD to work externally with states, local agencies and water purveyors to provide information on ORD research and technical assistance.

- 5 arsenic water treatment pilot projects created in Region 9
- 6 multi-day arsenic treatment workshops presented in Region 9 for water purveyors
- Numerous site visits and outreach to individual purveyors
- Research on a variety of treatment technologies and options, not one-size-fits all

Region 10

Title: ORD/Region Workshop: Protection of Human Subjects in EPA Regions' Research and Non-Research

Best Practice: Groups of ORD scientists meeting with Regional staff in the Region. ORD scientists worked with the Region 8 and 10 Regional Science Liaisons to develop audioteleconference seminars that addressed a Regional concern. When more information was needed, a group of ORD experts traveled to Region 10 to participate in a workshop. Because ORD recognized the importance of the subject, travel support was provided thereby allowing a representative from every Region to participate. Furthermore, ORD presenters worked with the Regional Science Liaisons while developing their workshop presentations, and incorporated feedback to improve the effectiveness of the presentations for the Regional audience.

Background: As a result of a series of audioteleconference seminars arranged by Region 10 for EPA staff located in all of the EPA Regions, for the first time, both ORD and Regions became aware that activities occurring within Regions, or within the oversight of EPA Regions, may be subject to protections required by federal statute under the Common Rule and EPA's Order regarding the protection of human subjects. To address the sensitivity of the topic, and facilitate the degree of dialogue and information exchange that was needed to gain a common understanding of the Common Rule, its background and requirements, as well as EPA processes to comply with this federal statute, an ORD/Region workshop was held in Seattle, Washington.

Science: ORD experts interacted directly with Regional staff to discuss this sensitive topic. Discussions included the role of EPA Human Subjects Research Review Official (HSRRO), federal wide assurance requirements, Institutional Review Boards, NHEERL policies and guidance, EPA's Order, public health practice, Special Protections for Children, Fetus, Elderly, Lower Socioeconomic Groups, English as a Second Language Groups, as well as, EPA's Third Party Rule and EPA Human Subjects Review Board. Regional scientists presented case studies where "human subjects", "research" and/or public health practice activities might be an issue.

Outcomes:

- (5) Each Region now has an individual designated to determine whether a Region's activity is subject to requirements of the Common Rule, or a point of contact to link with experts in ORD and Dr. Warren Lux, the Human Subjects Research Review Official, in the Office of the Administrator.
- (6) The Agency's HSRRO, Dr. Warren Lux, has established a Regional Workgroup including representatives from every Region. The workgroup will serve to provide consistent communication and education opportunities for Regions regarding the protection of people and their personal information with whom the Agency interacts in research, as well as in public health practice activities.
- (7) Regions are conducting training for their staff on the topics of human subjects research and public health practice activities.

Title: Improving Fish Habitat Using Innovative Strategies to Remediate Contaminated Sediments in the Columbia River Basin (Sponsor: Washington State University)

Best Practice: Experts from more than one ORD lab provided timely and specific input on a research proposal to help Region 10 decision makers commit funding to an innovative scientific work effort. The EPA coordinator for the Columbia River Basin, a designated "Great Water Body", requested assistance from the Region 10 Regional Science Liaison (RSL) to obtain technical comments on a research proposal for which it was difficult to identify local, unbiased reviewers. NHEERL had previously engaged Region 10, as well as other ORD labs and OSWER, in the development of its contaminated sediment research multi-year implementation plan. Via NHEERL's intranet site, the RSL was able to access the document and the names of experts contained within it. The "best practices" exhibited in this example include: 1) In a meaningful way, Regions were engaged in developing a research implementation plan; 2) The subsequent document could be readily accessed; 3) The document included the names of ORD subject experts; 4) The ORD experts were readily responsive to the Region's request for technical assistance – in the opinion of the RSL – partially based on the pre-existing relationship developed while working together on the implementation plan.

Background: This project was among 59 submitted to the Council earlier this year in response to a solicitation intended to inject more creativity into the Columbia River Basin fish and wildlife enhancement effort. In total, \$16 million in funding was requested for

the proposals. The Northwest Power and Conservation Council (NWPPCC) requested assistance from EPA to provide scientific expertise on this innovative project proposal. EPA Region 10 ORD Liaison, Roseanne Lorenzana provided copies of the proposal to ORD scientists around the U.S. As a result, EPA Region 10 received substantive scientific comments from five ORD scientists, Prasada Rao S. Kodavanti, Linda S. Birnbaum, Dennis Timberlake, Robert M. Burgess, and Dave Mount. NWPPCC staff were very appreciative of the EPA scientific comments. The scientists provided input and comments that NWPPCC would not have access to without ORD input.

Science: Contaminated sediments represent a critical environmental problem that impairs fish habitat. The purpose of this proposal is to demonstrate an innovative cleanup strategy designed to treat toxic sediments. Cleanup of many soil and groundwater pollutants have been successfully achieved by applying chemicals that release oxygen to enhance biodegradation. The project will transfer this technology to sediments in an effort to improve fish habitat. Proponents say the strategy may be an attractive alternative to current remediation practices, such as dredging and capping, which are expensive and physically alter the natural substrate. EPA ORD scientists provided significant scientific expertise, not otherwise available, to this proposal review.

Outcomes: On September 11, 2007, the Northwest Power Planning recommended \$2.4 million in funding during fiscal years 2008-2009 for five projects that will test new methods and technologies designed to directly benefit fish and wildlife in the Columbia River basin. This sediment remediation project was among the five projects approved. It is likely that the scientific input provided by EPA ORD scientists was instrumental in helping project funding approval.

SESSION: TECHNOLOGY

Region 1

Title: X-ray Fluorescence Instruments for Metals Detection in Soil and Dust Wipes

Best Practice: Conducting SBIR and ETV verification on technologies that have a direct application to our regulatory mission as an environmental protection agency.

Best Practice: SBIR funding and ETV verification

Background: The presence of toxic trace metals in the environment is a significant concern in site monitoring and clean-up assessments. Conventional laboratory analytical methods for determining trace metals are time consuming and costly, and may require multiple analytical methods to determine the target metals in a sample. For example, EPA SW-846 calls for digestion of samples from a variety of matrices (for example, soil, sediment, and dust) by acid digestion (Method 3050A) or microwave-assisted acid digestion (Method 3051) or by Method 3052 for difficult matrices. Analysis of the

sample digest is then conducted by inductively coupled plasma (ICP), with either atomic emission spectroscopy (Method 6010) or mass spectrometry (Method 6020) as the final detection method. To allow field personnel to quickly assess the extent of metals contamination at a site, a simple, rapid, cost effective field screening method that is applicable to a wide variety of target metals is critical.

Science: In 1992-6, EPA's SBIR Program gave NITON Phase I, II, & III funding to develop an onsite assessment technology for lead paint. NITON created a portable X-ray fluorescence (XRF) analyzer. In 95-97, they received DOE SBIR funding to create an XRF analyzer for screening trace metals in the field. These two SBIR technologies and more advanced versions were then verified by ETV in 1996-2000. Notable advantages to using XRFs include: field portability (small, battery-operated), high sample throughput (on the order of 30 to 60 samples per day), no chemical waste, and non-destructive analysis, such that confirmation analysis can be performed by laboratory methods on the identical sample that was analyzed in the field.

Outcomes:

- (1) Region 1 has used XRF to detect lead paint, lead paint dust, and metals in soil.
- (2) Currently, the Region's enforcement inspectors and state childhood lead prevention inspectors use XRF during their inspections of urban housing in New England. The ease of lead paint detection has dramatically improved with the development of XRF, which has enabled the inspectors to document the presence of lead during the inspection and therefore seek immediate abatement to protect the health of children.
- (3) XRF was also used in the Lead Safe Yard Project, which took 2,745 soil samples from 100 backyards; the technology enabled the EPA team to respond immediately in setting up low income remedial measures to help mitigate the dermal in ingestion exposure from lead flakes.
- (4) For hazardous waste sites in New England, the Region has mainly tested soil for lead and cadmium, but also nickel, zinc, chromium, arsenic, and antimony. The Region's mobile laboratory will take between 200-300 samples over 2-3 days, and with field analysis, they can fine tune the sampling, determine the "hot spots", and check levels of concentration to determine proper disposal of the soil. XRF has enabled them to be more efficient because they can act on the information in the field whereas if they sent every sample to a laboratory it could take between weeks and months to receive the results. In 2004, the Region 1 laboratory has conducted more than 50% of their work on site or 5,000 field analyses using XRF or gas chromatography.

Region 2

Title: Evaluation of Remedial Technologies in Region 2

Background

The use of innovative remedial technologies has been increasing in Region 2, often involving new approaches with which the Region 2 staff has little experience. For such

technologies, ORD expertise is often needed to evaluate, select and/or implement innovative remedial technologies. Assistance from the Technical Support Centers at the National Risk Management Research Laboratory (NRMRL) is available to provide such assistance. Other options for NRMRL technical assistance have included the Superfund Innovative Technology Evaluation (SITE) Program. Several examples of Region 2 projects utilizing ORD technical assistance are listed below.

Science

Innovative technologies which Region 2 has evaluated, selected and/or implemented in recent years include chemical oxidation (e.g., at the Fulton Avenue Superfund site), chemical reduction (e.g., at the Puchack Wellfield Superfund site) and bioremediation (e.g., at the Ciba-Geigy Superfund site). Region 2 is also evaluating innovative remedial technologies which have the potential of producing marketable byproducts, such as sediment washing and the "cement-lock" thermal treatment process. These two processes have been evaluated for New York/New Jersey Harbor sediments and for contaminated sediments from the Passaic River Operable Unit of the Diamond Alkali Superfund site.

Outcomes

NRMRL technical assistance was requested and received for the above projects. At the Fulton Avenue Superfund site, NRMRL assistance contributed to the Region 2 proposal of a remedy which includes in situ chemical oxidation. (Region 2 plans to issue the Record of Decision in FY' 07.) At the Puchack Wellfield Superfund site, NRMRL's review and comment on the treatability study contributed to the selection of the in situ chemical reduction remedy which is currently being designed. At the Ciba-Geigy Superfund site, NRMRL technical assistance contributed to the currently operating remedy, which includes bioremediation (both in situ and ex situ). For the Passaic River Operable Unit of the Diamond Alkali Superfund site, the SITE Program has completed all field work, sampling and analysis for the two technology demonstrations. Final SITE Program reports are currently undergoing review.

What made the technology transfer successful and issues of concern

The SITE Program, which has been of great assistance to Region 2, is currently being phased out, eliminating a valuable resource. The National Exposure Research Laboratory has decided to close the Technical Support Center at its Environmental Sciences Division in Las Vegas. There are reports about plans to eliminate the Ground Water Technical Support Center at the NRMRL's Groundwater and Ecosystems Restoration Division in Ada, OK as part of a reorganization of that Division. (Technical support to the Regions from that Division may still be possible following the planned reorganization.) The impacts of these planned changes on technical support to the Regions aren't clear at this time.

Region 3

Title: Collaboration to Evaluate Immunoassay Test Kits for the Detection of EDCs

EPA Regions 3 and 5, ORD (NRMRL), USGS, and Abraxis, LLC, have joined in a collaborative effort on a Regional Methods project, utilizing the Environmental Technology Verification program, to evaluate immunoassay test kits for the quantitative determination of endocrine disrupting compounds (EDCs). Currently, high performance liquid chromatography (HPLC), gas chromatography-mass spectrometry (GC-MS), or liquid chromatography-mass spectrometry (LC-MS) are the primary methods used to detect EDCs; however, immunoassay techniques, particularly enzyme-linked immunosorbent assay (ELISA), are becoming increasingly popular due to their sensitivity, ease of use, short analysis time, and cost-effectiveness. Issues persist, however, regarding reproducibility and accuracy when complex environmental samples are analyzed. The primary objective of this research, therefore, will be to evaluate whether commercially available ELISA kits are able to accurately and reliably analyze common environmental samples for selected EDCs. The round robin laboratory evaluation will be done in four phases, each focusing on a different type of water sample (clean water, surface water, WWTP effluent, and WWTP influent) spiked with EDCs. Samples will be analyzed by both ELISA and GC-MS and results compared. If validated, the ELISA technique could provide a relatively easy method for use by Regions, ORD, and state and local programs as a screening tool, much faster and more cost effective than traditional GC-MS, HPLC, or LC-MS methods.

Title: Critique of Homeland Security Method for Anthrax Detection

Region 3 was approached by one of our universities that received a congressional line item to develop a portable anthrax detection system. The university researchers wanted to come to the Region to brief the OSCs/RPMs on the technology. The method involved some novel molecular and nanotechnology techniques that no one in the Region had any experience utilizing. Several ORD scientists were willing to participate in a teleconference with the researchers and give a reality check on the technology and provide some valuable information to the researchers on validation and getting a method utilized by the Agency. They provided an informal, objective review, taking some of the pressure off the region due to political interest in the project. These type of reviews are very important for the region in trying to understand and determine the value of the numerous technologies brought to them.

Title: Guide on Microbial Source Tracking

Trying to determine the sources of microbial contamination in surface waters has been a very controversial issue and important in the TMDL, recreational waters, and other programs. Numerous analytical techniques have been developed, ranging from the fairly basic approach using variations in antimicrobial resistance to the much more sophisticated molecular methods, e.g., ribotyping. The researchers all seem to claim their method is the best, but repeated multi-laboratory studies have demonstrated that they all have deficiencies and there is no "gold standard". Despite the limitations of the methods, states and counties are selecting a method and utilizing the technique for regulatory actions.

ORD has been performing extensive research in this area but recognized that there will be no one perfect method available in the near future. To address this issue, ORD collaborated with 7 regions to develop a Guide on Microbial Source Tracking to highlight the pros and cons of the different methods. Although this effort didn't resolve the problem of which method to select, it did provide a level playing field, so no matter which method was selected, the practitioners would have a basic understanding of the limitations that could be explained if a regulatory action was challenged. ORD should consider more of these types of efforts when no one technology is broadly accepted, but since the Regions and their clients must move forward in their environmental protection initiatives, they have a firm scientific basis for selecting a technology.

Region 4

Title: Dioxin-Furan Fingerprinting: Lower Roanoke River Site, North Carolina

Background: The southeastern United States is heavily concentrated with facilities related to the wood, pulp, and paper industries. Many times these facilities are located within close proximity. The Weyhauser Paper Plant and the Georgia Pacific Hardwood Saw Mill are large facilities located along the lower Roanoke River in North Carolina. The two facilities and the river were being investigated and remediated as part of the National Priority List. Wastes from the facilities included dioxins and furans, along with numerous heavy metals, pesticides and other contaminants. In addition, there are Publicly Owned Treatment Works (POTW) discharges along the river.

Science: To fully characterize the Site and assess responsibility, scientists needed to distinguish the dioxins and furans from the various industrial sources and the POTWs. ORD's National Exposure Research Laboratory, the Superfund Technical Liaison, and the Region 4 Project Manager undertook "fingerprinting" of the dioxins and furans in the Lower Roanoke River to determine liability and cleanup issues. The fingerprinting was accomplished using sampling and analysis of river, POTW, and onsite soil, water, sludge, and sediment samples performed as part of the site investigation; literature data on typical dioxin/furan congeners found in urban POTW discharges; and an evaluation of the individual dioxin/furan source fingerprints maintained by NERL and its contractors.

Outcome: Using the fingerprints derived from point sources at the site and POTWs, and from literature about POTW discharges, the ORD scientists determined that the dioxins and furans found in the POTW discharges were contributing to the contamination of the river and could be distinguished from those dioxins and furans characteristic of each industrial facility. By using the FALCON statistical analysis, the relative contribution of each source was calculated, the pathways were understood, and liability was correctly attributed to the POTWs.

What made this technology transfer successful: The close cooperation between the ORD scientist, the Superfund Technical Liaison, and the Region 4 Project Manager.

Region 5

Title: Use of Copper Mine Tailings on Lake Superior Coastline as Raw Material in the Manufacture of Roofing Shingles

Problem Statement: Improving the Great Lakes by developing a beneficial use in the cleanup of contaminated copper mine tailings that have accumulated on the Lake Superior Coastline. Specifically, the goal of the study is to convert the environmentally problematic copper mining waste “stamp sand” into beneficial algae resistant roof granule material.

Background: The Keweenaw area of Upper Michigan has been used as a dumping ground for the tailings emanating from copper mining over many years. The Lestech Corporation found that the tailings (now called stamp sands) were a basaltic base with enough copper to be algae resistant. Lestech applied for a feasibility grant (\$70,000) under the Small Business Innovation Research (SBIR) program of ORD to study the chemical and physical characteristics and develop a process for converting the waste sands into roof granules.

Positive Outcomes: This preliminary research showed that expensive copper-coated algae resistant roof granules can be substituted with the stamp sand copper mining waste from Upper Michigan. It was found that about 80% of the stamp sand could be converted to roof granule use by proper selection based upon sieve classification.

This research provided the feasibility of the beneficial use of waste tailings for roof granules. This is the first step in commercial development of the material.

Regional and ORD Staff Involved: Region 5: David Macarus, OSEC/ ORD: Jim Gallup, SBIR program.

What Made the Project Successful: The good analysis of the potential use of waste tailings as roof granule raw material coupled with ORD’s SBIR program, which is aimed at testing the feasibility of new technology.

Region 6

Title: Evaluation of Remote Sensing Infrared Camera

Best Practice: Cooperation in a RARE project. Providing support in determining the usefulness and applicability of new technology.

Background: EPA Region 6 and the Louisiana Department of Environmental Quality evaluated air quality in one of the Louisiana cities, and discovered that the air quality was worse than what would be predicted by consideration of known releases from permitted facilities. A new commercial camera using infrared technology was proposed as a possible way to get an estimate of emissions from tank cars and barges on the Mississippi

River in the area. A scientist from NERL/ESD teamed with a Region 6 scientist to test the camera in a RARE project.

Science: The Hawk motion picture camera uses infrared to show fugitive emissions from openings in tank cars, barges, and other sources. The project involved a fly-over of the river area and railroads to see if the camera would pick up emissions from the air. Video recordings were made both with the Hawk camera and a regular video camera.

Outcomes: The Hawk camera showed clear and dramatic evidence of leaks. LDEQ took this information and showed it to the company officials whose barges and cars were leaking, and they readily agreed to have the leaks fixed (which were in their best interest, since it was their product that was being lost).

ORD and R6 Points of Contact: David J. Williams, NERL; Michael Miller, Reg. 6.

What made the technology transfer successful: Close cooperation between ORD and R6.

Title: Alternative Asbestos Control Method

Best Practice: Cooperation on new Asbestos Method.

Background: The Asbestos NESHAP requires an extensive procedure for removing asbestos when buildings are demolished. Because the procedure is so costly, many communities are forced to leave derelict buildings standing for lack of funding to demolish them. A new, less costly but still environmentally protective method was needed.

Science: NRMRL engineers in Roger Wilmoth's group worked with Region 6 engineers on demonstrating a new method (the Alternative Asbestos Control Method, or AACM) which is similar to the NESHAP method for building destruction under "imminent danger" conditions, but using foam instead of water. The method was tested at Ft. Chaffee, AR, but demolishing two virtually identical side-by-side buildings, one using the NESHAP method and the other using the AACM.

Outcomes: The AACM performed well, being as environmentally protective, but being faster and cheaper. This result is very promising, but further research is needed to prove it under a variety of conditions. The ultimate result could be millions of dollars of savings for cities and much faster action in removing old buildings so that other uses can be made of the land.

ORD and R6 Points of contact: Roger Wilmoth, Bob Olexsey, NRMRL; Adele Cardenas, Region 6

What made the technology transfer successful: Close cooperation between ORD and R6.

Region 7

Title: Small Business Innovation Research

Problem Statement

Region 7 has the need for technologies to be developed that are meeting the needs of critical Regional environmental issues

Background

SBIR has a mandated % of research funding every year for innovative technology development by small businesses

Outcomes

- Region 7 participated in FY06 solicitation
- More than 7 proposals related to R7 technology needs were awarded
- Relationships developed between small businesses and Region 7
- Region 7 formed a relationship w/ the SBIR program and is now working at a higher level on the FY08 solicitation for desperately needed environmentally beneficial biofuels technologies

EPA Contacts

ORD Contact: Jim Gallup and April Richards

Regional Contact: Brenda Groskinsky, Regional Science Liaison

Title: Asbestos Remediation

Problem Statement: Needed technical assistance with asbestos remediation at the St. Louis Airport

Background: Highly controversial asbestos removal project

Positive Outcome(s) that aided the Region in assessing a problem or assisting a decision: Excellent technical advice that aided towards a successful removal

Regional and ORD staff involved: Lynn Slugantz (R7), Brenda Groskinsky (R7) Glenn Shaul (ORD), Roger Wilmoth (ORD)

What made the Technology Transfer Successful! : Timely, consistent and effective support throughout the entire project.

Title: Environmental Efficiencies w/ Biofuels Refining Industry

Problem Statement: Rapidly growing biofuels industry in need of environmental solutions

Background: Incentive driven industry of bio-based fuels is growing rapidly in the Midwest and in need of environmentally friendly technology innovations.

Positive Outcome(s) that aided the Region in assessing a problem or assisting a decision: Use of the Small Business Innovation Research Program provided a means for Region 7 to investigate new technologies and funding opportunities that would not otherwise be available.

Regional and ORD staff involved: Brenda Groskinsky (R7), James Gallup (ORD)

What made the Technology Transfer Successful! SBIR Program very supportive of Region 7 technology needs. More than 7 technologies under development for bio-based fuel category.

Title: Lead Mining Waste Remediation

Problem Statement: Region 7 needs innovative means for effective large scale remediation solutions.

Background: There are over 1000 lead mine tailing piles in Missouri and Kansas that are in need of remediation.

Positive Outcome(s) that aided the Region in assessing a problem or assisting a decision: Use of the Small Business Innovation Research Program provided a means for Region 7 to investigate new technologies and funding opportunities that would not otherwise be available.

Regional and ORD staff involved: Brenda Groskinsky (R7), James Gallup (ORD)

What made the Technology Transfer Successful! Building relationships w/ local small business in the newly developed remediation opportunities.

Region 8

Title: Sulfate Reducing Bacteria Bioreactors for Remediation of Acid Mine Drainage in Region 8

Background: Remediation of mine waste sites across the country requires good site characterization, careful planning, and sometimes millions of dollars for effective clean-up and perpetual treatment of acid mine drainage (AMD) using conventional lime or soda ash plants. One of the most significant environmental and water quality problems in Region 8 is AMD from both historic abandoned and operating hard rock and metal mines. There is a great need for innovative and effective semi-passive treatment technologies that can help reduce costs and reliance on perpetual treatment. The National Risk Management Research Laboratory's (NRMRL) Mine Waste Technology Program is investigating and testing many innovative remediation technologies, and has annual funding opportunities for innovative technology research projects. NRMRL's Engineering Technical Support Center (ETSC) has also been providing support to the

regions on a wide range of mine waste innovative remediation technology projects throughout the U.S.

Science: One of the most prominent semi-passive technologies for AMD is the use of sulfate-reducing bacteria bioreactors (SRBs). These reactors use anaerobic bacteria to reduce sulfate in AMD to hydrogen sulfide. The sulfide then reacts with dissolved metals in the AMD to form insoluble metal sulfides which precipitate and settle out of solution. Some form of organic compost substrate, such as cow manure and straw, is used as the carbon source for the bacteria. The ETSC has been a leader in developing this technology, and has implemented successful demonstrations in several regions. The ETSC is also studying the microbiological aspects of these bioreactors, working with researchers at the Colorado School of Mines and Colorado State University to understand issues regarding what makes them fail, what are the rate limiting reactions inside the cells, and how can we make them smaller and more efficient. Region 8 has been working with the ETSC and ORD researchers to evaluate current and future best practices for design and operation of these innovative technologies, the use of SRBs at the Upper Tenmile Creek Mining Area and Basin Mining Area Superfund Sites in Montana. ETSC has been testing compost SRBs as part of a combination geochemical bioreactor with pre- and post-treatment wetlands at the Upper Tenmile Creek Superfund Site. A geochemical bioreactor essentially includes limestone rocks in channel discharging to a winding or "serpentine" SRB (four separate cells) to provide adequate contact time for geochemical and biological reactions to occur for metals precipitation throughout the system.

Outcome: In 1999, the site Remedial Program Manager (RPM) contacted the ETSC requesting assistance for the consideration of passive treatment. After a meeting and site visits by ETSC staff and contracted experts, two areas of the site were selected for testing. Both areas are above 7,800 feet in elevation, have no electric power and are difficult to access between November and June. At the first area, Peerless Jenny King Mine, ETSC staff, assisted by their contractor, Golder Associates, and the site contractor constructed wetlands and a bioreactor in September, 2002. The unique design handles flows up to approximately 50 gallons per minute of AMD water with a pH greater than 5 and zinc concentrations greater than 2,000 ug/L. The system is increasing pH to greater than 7 and reducing metals concentrations by more than 90% to meet EPA and State of Montana water quality standards. The system is virtually totally passive, requiring no power and almost no maintenance.

The second area in the adjacent Basin Mining Area Superfund Site is the Luttrell Repository, which was the old mine pit. This million cubic yard joint repository was designed to accept mine wastes from both government and private landowners in the region. A leachate collection system was constructed so that when the repository is filled and capped, the leachate will be sent to the geochemical bioreactor for treatment and then discharged. ETSC has been testing the SRB and collecting data for 2 years, and will continue into the future. The results have been exceptional, with the discharge from the reactor meeting all Montana water quality standards except for zinc and sulfate (zinc inflow concentrations up to 40,000 ug/L). Because the system was only recently constructed and became operational, greater improvement in effluent water quality is

expected over time. There is also strong collaboration with the U.S. Forest Service and Bureau of Land Management, the primary land owners in the watersheds.

What made this technology transfer successful: Building an effective and long lasting collaborative relationship between the ORD scientists working for NRMRL's Engineering Technical Support Center, EPA Region 8 Remedial Project Manager, Region 8 Superfund and Technology Liaison, and regional academic institutions. The results of this technology are exceptional and this contributes to making this technology a tremendous success.

Region 9

Title: ORD's Technical Support Centers: A Valuable ORD "Best Practice" Resource for the Regions

ORD's efforts to provide useful products and tools to the Regions have increased in recent years. The ORD Superfund Technical Support Centers (TSCs) and the Superfund and Technology Liaison (STL) Program have been held up as one of these valuable resources for the regional Superfund and RCRA staff. In fact, the TSC format has been cited in the "45 Day Study" as a successful model for other regional programs. The value of the TSCs has been highlighted in many other forums, including those cited below.

- Annual progress reviews of waste research conducted by ORD, OSWER and the Regions
- Board of Scientific Counselors (BOSC) meeting (Dec. 2005)
- ORD's Science-To-Outcome efforts (early 2006)
- ORD (OSP) visits to all 10 regions (early 2007)

The Superfund TSCs are a "best practice" example of the Regions and ORD working together to solve environmental problems. This program allows the regions to tap into the expertise of ORD researchers through technical support, and also allows the researchers to have an insight into present and emerging environmental problems facing the regions. It's beneficial both ways.

Each region's experience is slightly different, but we in Region 9 agree that the TSCs, accessed both through our onsite ORD STL and with staff contacting the TSCs directly, has been beneficial in assisting our staff make better informed cleanup decisions. The program is in itself a best practice. There are many examples of valuable support to Region 9, and here are a few:

- Pemaco Site – evaluation of potential vapor intrusion into homes
- Asbestos – assistance with investigation design for naturally occurring asbestos sites
- Leviathan Mine – assistance with treatment technology evaluation
- Casmalia Landfill – assistance with geophysical site characterization and monitoring

There are generally 3 TSCs used by staff (Cincinnati, Las Vegas, and Ada), although other contacts with ORD scientists have also been helpful. It has now become apparent that this commitment to the TSC program is diminishing.

The Las Vegas TSC was officially disbanded yesterday (on October 1st) and its oversight function handed over to ORD's OSP and the STL program. There will be some Las Vegas scientist assistance, but most of the technical support will be handled by extramural resources (Lockheed and an IAG through DOE). Three of the STLs will now cover the functions of this center and funding beyond FY08 is uncertain. In addition, there has been recent discussion about a proposal to disband the TSC at the Ada Lab. Details on this proposal are less clear, but these changes represent obvious decreases in ORD support that have been valued by the regions since 1987.

If ORD truly wishes to continue to provide useful resources to the Regions, returning to past TSC commitments should be considered. Regions need to retain this "best practice" support to assist in making scientifically based and cost effective decisions.